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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
BENNETT, JENNIFER D	

ART UNIT	PAPER NUMBER
2878	

NOTIFICATION DATE	DELIVERY MODE
07/07/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/582,895	SEO ET AL.	
	Examiner	Art Unit	
	JENNIFER BENNETT	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 May 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-16 and 18-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *14-16,18 and 19* is/are allowed.

6)☒ Claim(s) *1 and 3-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to amendments and remarks filed May 14, 2010. Claims 1, 3-16 and 18-20 are currently pending.

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 14, 2010 has been entered.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 4, 5, 12 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Amako et al. (US 5497254).

Re claim 1: Amako teaches a laser processing apparatus (fig. 1, 21, 24 and 30) comprising: a laser source (104); a spatial phase modulator (106) configured to modulate a phase of a laser beam emitted from the laser source (col. 3, lines 51-53); a synthetic data generator (101 and 102) configured to generate synthetic data by combining hologram image data representing a pattern image (col. 16, lines 27- 31, the image) to be processed with position displacement hologram data (col. 16, lines 27-31, the Fresnel transformation, col. 13, lines 36-55) for shifting the pattern image to a prescribed position (col. 13, lines 36-55), said synthetic data being input to the spatial phase modulator for the phase modulation of the laser beams (see fig. 1 and 24); and a focusing optical unit (107) configured to guide the phase-modulated laser beam onto a surface to be processed to reproduce the pattern image on the processed surface (108), wherein the position displacement hologram data include either a horizontal hologram data set representing displacement in a direction parallel to the processed surface (see fig. 19), a vertical hologram data set representing displacement in a direction perpendicular to the processed surface (see fig. 19 or 18), or a combination of the horizontal and vertical hologram data sets (see fig. 19) (fig. 19 uses the applied transformations to shift the image produced by the computer in both horizontal (X and Y directions, parallel) and vertical ((focal plane change, perpendicular) direction) (the Fresnel portion of the spatial modulator would adjust the focus so that the image is formed at a different perpendicular position to the surface being processed), wherein

the vertical data in one embodiment is the only data used and combined with the image (see fig. 18), wherein both the vertical and horizontal data are combined with the image data (see fig. 20), and the hologram data with the horizontal and vertical data are used to calculated an image to be reproduced (col. 17, lines 15-26). The language of "wherein the horizontal data set and the vertical data set are distinct from each other and calculated separately" does not provide any additional structural limitations and is not given any patentable weight in an apparatus claim. Since the same structure is disclosed by Amako, as understood, the "wherein clause" is also present in the reference. That is, the "wherein clause" does not add any structural limitation to the device and is not given any patentable weight.

Re claim 4: Amako teaches the laser processing apparatus, wherein the vertical hologram data set having a phase distribution similar to a Fresnel zone plate (see fig. 19 or 18) (col. 16, lines 27-35).

Re claim 5: Amako teaches the laser processing apparatus, wherein a distance from the spatial phase modulator to the focusing optical unit is equal to a focal length of the focusing optical unit (fig. 16, 30, 31, and 33).

Re claim 12: Amako teaches the laser processing apparatus, further comprising: a second driving unit (2409) configured to move a position of the processed surface relative to the focusing optical unit in a direction perpendicular to the processed surface (col. 16, lines 11-26).

Re claim 20: Amako teaches the laser processing apparatus, wherein the combination of the horizontal hologram data set and the vertical hologram data set

includes adding the horizontal hologram data set and the vertical hologram data set together (see fig. 20, since the Fresnel portions are also horizontally displaced each with a different focal length then the two sets of data are added/to join/to combine/to unite together).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Amako et al. (US 5497254) in view of Hamano et al. (US 20040179253).

Re claim 3: Amako teaches the laser processing apparatus, wherein the position displacement hologram data include either a horizontal hologram data set representing displacement in a direction parallel to the processed surface (see fig. 19 or 13), a vertical hologram data set representing displacement in a direction perpendicular to the processed surface (see fig. 19 or 18), or a combination of the horizontal and vertical hologram data sets (see fig. 19) (fig. 19 uses the applied transformations to shift the image produced by the computer in both horizontal (X and Y directions, parallel) and vertical (focal plane change, perpendicular) direction), wherein the position data comes from either a Fourier transformation or a Fresnel transformation (Fourier, col. 18, lines 43-51, Fresnel, col. 13, lines 19-32 and col. 16, lines 27-35). Amako does not

specifically teach the horizontal hologram data set has substantially a saw-tooth phase distribution profile. One of ordinary skill would have used a saw tooth phase distribution for the Fourier transform/Fresnel transformation in order to produce a horizontal shift in the position of the image. As seen in Hamano, who teaches a computer generated hologram (fig. 3), wherein the positional translation of the image is formed by combining the image with a saw-tooth wave function (see fig. 3 and 4) (the hologram image is shifted horizontally, parallel to the processed surface). It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement a saw-tooth phase distribution as seen in Hamano with the hologram image and spatial modulator of Amako in order to provide the device with another way of translating the

7. Claims 6, 7 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amako et al. (US 5497254) herein after referred to as Amako ('254) in view of Amako et al. (US 5589955) herein after referred to as Amako ('955).

Re claim 6: Amako ('254) teaches using a video camera to send an image to the modulator in order to reduce distortion in the modulator (Amako '955, col. 19, lines 1-32). Amako does not specifically teach a wavefront measuring unit used to measure the wavefront of a laser beam to correct for distortions in the wavefront. Amako ('254) teaches the laser processing apparatus, further comprising: a wavefront measuring unit configured to measure a wavefront of the laser beam input to the spatial phase generator; wherein the synthetic data generator generates correction data for correcting distortion of the wavefront of the laser beam detected by the wavefront measuring unit,

and the correction data are supplied to the spatial phase modulator (col. 10, lines 32-48). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a wavefront unit as in Amako ('254) with the device of Amako ('955) in order to more accurately measure wavefront distortion and use the value to correct the final image formed by adjusting the modulator providing for higher quality three dimensional models.

Re claim 7: Amako ('254) teaches adjusting the light intensity distribution written on the modulator to avoid distortions and aberration in the modulator (col. 19, lines 51-57). Amako ('254) does not teach the apparatus further comprising at least one of: an irradiation time adjusting unit configured to regulate irradiation time of the laser beam; and a beam intensity adjusting unit configured to regulate an intensity of the laser beam. Amako ('955) teaches the laser processing apparatus, further comprising at least one of: an irradiation time adjusting unit (107) configured to regulate irradiation time of the laser beam (col. 7, lines 24-30); and a beam intensity adjusting unit configured to regulate an intensity of the laser beam (col. 10, lines 16-24). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the light adjusting as in Amako ('955) with the device of Amako ('955) in order to control the intensity of the reproduced image providing for accurate three dimensional image forming.

Re claim 10: Amako ('254) teaches the laser processing apparatus wherein the data combined with the image data is just the vertical data (fig. 18 and col. 13, lines 1-32). Amako ('254) does not teach the apparatus further comprising: a first driving unit

configured to move a light spot of the laser beam relative to the processed surface in a direction parallel to the processed surface. Amako ('955) teaches the laser processing apparatus, further comprising: a first driving unit (fig. 17) configured to move a light spot of the laser beam relative to the processed surface in a direction parallel to the processed surface (col. 13, ;lines 63- 71 and col. 14, lines 1-31 and see fig. 17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the driver as in Amako ('955) with the laser of Amako ('254) in order to provide the reproduced image with a plurality of different dimensions.

8. Claims 8, 9, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amako et al. (US 5497254) in view of Thompson, Jr. et al. (US 6717104).

Re claim 8: Amako teaches a laser processing apparatus (fig. 1, 21, 24 and 30) comprising: a laser source (104); a spatial phase modulator (106) configured to modulate a phase of a laser beam emitted from the laser source (col. 3, lines 51-53); a synthetic data generator (101 and 102) configured to generate synthetic data by combining hologram image data representing a pattern image (col. 16, lines 27- 31, the image) to be processed with position displacement hologram data (col. 16, lines 27-31, the Fresnel transformation, col. 13, lines 36-55) for shifting the pattem image to a prescribed position (col. 13, lines 36-55). Amako does not teach the laser processing apparatus, further comprising: a horizontal-direction position detector configured to detect a horizontal position in a plane parallel to the processed surface; wherein the synthetic data generator generates the horizontal hologram data set based on the

detection result. However, since Amako teaches that depth translation is achieved when the focal length of the lens function superposed on the hologram data is changed (see fig. 20), one of ordinary skill would implement a surface distance measurement, and incorporate the new distance measurement by changing the lens phase function and superposing it to the hologram. As further evidenced by Thompson, who teaches a laser machining application (fig. 2), comprising a camera (25) to detect the image pattern on the processing surface (see fig. 2) then using the data to adjust the phase position of the hologram image (col. 5, lines 46-55). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the camera in Thompson to image the processing surface and use the data to adjust the hologram image in Amako and apply it to the spatial modulator to improve the improve upon the desired irradiance pattern providing for a more accurate machining operations.

Re claim 9: Amako as modified by Thompson teaches the laser processing apparatus, wherein the horizontal-direction position detector detects a reference pattern formed on the processed surface (Amako, see fig. 10, Thompson, col. 5, lines 46-55).

Re claim 11: Amako teaches a laser processing apparatus (fig. 1, 21, 24 and 30) comprising: a laser source (104); a spatial phase modulator (106) configured to modulate a phase of a laser beam emitted from the laser source (col. 3, lines 51-53); a synthetic data generator (101 and 102) configured to generate synthetic data by combining hologram image data representing a pattern image (col. 16, lines 27- 31, the image) to be processed with position displacement hologram data (col. 16, lines 27-31, the Fresnel transformation, col. 13, lines 36-55) for shifting the pattern image to a

prescribed position (col. 13, lines 36-55). Amako does not specifically teach the laser processing apparatus, further comprising: a vertical-direction position detector configured to detect a positional relation between the focusing optical unit and the processed surface in a direction perpendicular to the processed surface; wherein the synthetic data generator generates the vertical hologram data set based on the detection result. However, since Amako teaches that depth translation is achieved when the focal length of the lens function superposed on the hologram data is changed (see fig. 20), one of ordinary skill would implement a surface distance measurement, and incorporate the new distance measurement by changing the lens phase function and superposing it to the hologram. As further evidenced by Thompson, who teaches a laser machining application (fig. 2), comprising a camera (25) to detect the image pattern on the processing surface (see fig. 2) then using the data to adjust the phase position of the hologram image (col. 5, lines 46-55). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the camera in Thompson to image the processing surface and use the data to adjust the hologram image in Amako and apply it to the spatial modulator to improve the improve upon the desired irradiance pattern providing for a more accurate machining operations.

9. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Amako et al. (US 5497254) in view of Yamada et al. (US 20030152756).

Re claim 13: Amako teaches the laser processing apparatus (fig. 1, 21, 24 and 30) comprising: a laser source (104); a spatial phase modulator (106) configured to

modulate a phase of a laser beam emitted from the laser source (col. 3, lines 51-53); a synthetic data generator (101 and 102) configured to generate synthetic data by combining hologram image data representing a pattern image (col. 16, lines 27- 31, the image) to be processed with position displacement hologram data (col. 16, lines 27-31, the Fresnel transformation, col. 13, lines 36-55) for shifting the pattern image to a prescribed position (col. 13, lines 36-55) and the device is used for shaping three dimensional surfaces (col. 1, lines 48-50). Amako does not specifically teach the laser processing apparatus, wherein the laser source is an ultra-short pulse laser source with a pulse width at or below several picoseconds. One of ordinary skill in the art would have known to use a certain pulse width for the laser dependent upon the use of the device. As taught in Yamada. Yamada teaches a process for processing a three dimensional structure (abstract), wherein the laser can have different pulse widths dependent upon material being formed (paragraph 222 and 223). It would have been obvious to one of ordinary skill in the art at the time the invention was made to pulse the laser at or below several picoseconds as in Yamada in order to have a laser process device of Amako that can produce a three dimensional object in a resin or metal.

Allowable Subject Matter

10. Claims 14-16, 18 and 19 are allowed.

11. The following is a statement of reasons for the indication of allowable subject matter:

In regards claims 14 and 16: The prior art of record individually or in combination fails to teach the laser processing apparatus as claimed, more specifically comprising: a position displacement data that is either a horizontal hologram data set representing displacement in a direction parallel to the processed surface, a vertical hologram data set representing displacement in a direction perpendicular to the processed surface, or a combination of the horizontal and vertical hologram data sets~ and wherein the horizontal data set and the vertical data set are distinct from each other and calculated separately. Since Amako does not clearly disclose a method/process wherein the two different data sets are calculated separately then the above portion with the method claims is allowable in combination with the rest of the claim.

Claims 15, 18 and 19 are allowed because of their dependency on the above claims.

Response to Arguments

12. Applicant's arguments with respect to claims 1, 3-13, and 20 have been considered but are moot in view of the new ground(s) of rejection.

13. Applicant's arguments, see Arguments, filed April 21, 2010, with respect to claims 14-16, 18 and 19 have been fully considered and are persuasive. The rejection of the claims has been withdrawn.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JENNIFER BENNETT whose telephone number is

(571)270-3419. The examiner can normally be reached on Monday - Friday 0730 - 1700 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 571-272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. B./

/Georgia Y Epps/
Supervisory Patent Examiner, Art Unit 2878